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of light from the planet to the earth, as, for instance, in Herschel's paper on *Saturn* in his volume of *Cape Results;* while at others it means the excess of such interval above a definite minimum, as in Delambre's Tables of *Jupiter's* Satellites.

"Now, in attempting to transform Airy's formulæ so as to suit my purpose, from grades to degrees, and from Greenwich mean time to Madras sidereal time, and taking the light-equation in its *first* sense, I found a wide difference between the observed and computed places of the satellite; and though this was reduced by adopting Delambre's sense, the difference was still large enough to leave room for doubt. This might arise from some error in my computation; but as no such error could be readily detected, and as there was no one on whom I could thoroughly depend to repeat the computation, it seemed better to adopt an independent epoch, of the meaning of which I could be quite certain, than to lose time in trying to hunt up my error, or in a reference to Mr. Airy himself, the reductions having been made in Madras.

P. S. I regret to have to indicate the following errata, which have been discovered in my papers:—

Pages 37 and 38, column 12, heading, *for* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1855+}$, *read* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1850+}$.

39, column 12, heading, *for* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1858+}$, *read* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1850+}$.

40, columns 8 and 12, heading, *for* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1858+}$, *read* $\genfrac{}{}{0pt}{}{\text{Epoch}}{1850+}$.

45, line 12 from foot, *for* $=-86{\cdot}59$, *read* $=+86{\cdot}59$.

45, line 10 from foot, *for* $+348{\cdot}7\,x$, *read* $+3487\,x$.

Raglan House, West Malvern, August 29, 1859.

Corrections of the Elements of the Moon's Orbit, deduced from the Lunar Observations made at the Royal Observatory of Greenwich from 1750 *to* 1851. *Being an extension of a preceding Memoir entitled "Corrections of the Elements of the Moon's Orbit, deduced from the Lunar Observations made at the Royal Observatory of Greenwich from* 1750 *to* 1830." By G. B. Airy, Esq., M.A., Astronomer Royal.

The author commences with a statement of the reasons which induced him to continue the reduction of the Greenwich Lunar Observations subsequent to 1830, on the same plan as that pursued in the great work on the reductions from 1750 to

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1830; and he at the same time mentions the circumstances which led him to fix upon 1851 as the final year which would be distinguished by the system of reduction hitherto employed. In the year 1836 some changes were made in the system of observations, and very important changes in the system of daily reductions. The elements in these were varied from time to time as the observations seemed to indicate, and the tabular comparisons were made with Burckhardt's Tables, then employed in the computations of the *Nautical Almanac*. Thus there were inconsistencies of reduction which it was desirable to remove, and tables of inferior character had been employed, which it was desirable to replace by tabular calculations made on the same theoretical elements as those of the preceding reductions. An occasion for recommencing the work, and a reason for fixing a definite limit, were alone wanting.

"The occasion and the reason," says the author, "were supplied by Mr. Adams' discovery of the error in Burckhardt's Tables of the Moon's Parallax, and his corrections to that element published in the *Nautical Almanac* for 1856. Astronomers cannot be too grateful to Mr. Adams for that investigation; not only because it corrects a very important error in the construction and numerical values of the Parallax Tables, but also because it brings together the investigations founded on different theories and different observations, shows their precise agreement when correctly treated, and finally establishes the whole doctrine of Lunar Parallax on a firm basis. Nothing has been done which has aided so much the daily reductions of lunar observations."

The author was enabled to use the parallax as corrected by Mr. Adams from the beginning of 1852. This circumstance alone was sufficient to induce him to fix on the end of 1851 as the definitive limit of the proposed reductions. He was further prompted to adopt this resolution by the probability which existed of the speedy publication of Hansen's Lunar Tables, and their employment in the computations of the *Nautical Almanac.*

The proposal of the author having met with the approval of the Board of Visitors of the Observatory and of the Lords Commissioners of the Admiralty, the computations were commenced in the beginning of 1856, and were finally brought to a close in the summer of the present year.

Before investigating the results which form the object of his paper, the author gives a statement of the groups in years into which he has divided the period (1750–1851) over which his observations extend, with the range of longitude of the moon's node corresponding to each group. It is worthy of remark that the materials of the last of these groups (1847–1851) consist solely of observations with the altazimuth.*

* Of course there is a corresponding group (1843–51) comprising exclusively meridional observations.—Ed.

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After giving the forms of the expressions for the comparison of the moon's observed places in longitude and in ecliptic polar distance with the corresponding tabular places, the author exhibits the equations depending on the new groups with the corresponding values of the unknown quantities, and combining the latter with the results of his former memoir (*Mem. Ast. Soc.* vol. xvii.) he obtains the definitive value of each unknown quantity. By means of these corrected values he then determines the most important corrections of elements and inequalities.

We now proceed to give the principal results of this important paper.

I.

Correction of Moon's Epoch of Longitude and Mean Motion.

The correction to Damoiseau's mean motion for one year is $+ 0''\cdot596$. Damoiseau's epoch is very nearly correct for 1806.

The difference between these numbers and those in the former memoir arises principally from the change made by Professor Hansen in the equations of long period.

II.

Correction of the Equation depending on the Elliptic form of the Earth.

This inequality has for its argument the mean place of the moon's node. The corrections being applied its entire value is found to be,—

$$+ 6''\cdot41 \times \text{sin longitude of moon's node}$$
$$- 1\cdot08 \times \text{cos longitude of moon's node.}$$

III.

Correction of the principal coefficient of the Equation of the Centre.

The corrected value of the coefficient of the sine of mean anomaly when the true longitude is expressed in a function of the mean longitude, as in Damoiseau's form, is:

$$22639''\cdot04$$

again the correction applicable to the moon's longitude,

$$\{- 0''\cdot69 \times \text{cos long. node} + 0''\cdot59 \times \text{sin long. node}\}\ \text{sin mean anomaly.}$$

IV.

Correction of Epoch and Motion of Mean Anomaly.

Damoiseau's epoch of anomaly is nearly correct for 1787; and the motion of anomaly in 100 years must be diminished by $35''\cdot5$.

The corrections to the moon's longitude are,—

$$\{+ 0''\cdot19\ \text{cos long. of node} + 1''\cdot60\ \text{sin long. of node}\}\ \text{cos mean anomaly.}$$

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V.

Small Terms depending on Combinations of the mean anomaly and the longitude of the node.

These terms may be expressed in the following form:—

$+0''{\cdot}46$ sin (mean anom. + long. node) $-0''{\cdot}20$ cos (mean anom. + long. node)
$-1''{\cdot}15$ sin (mean anom. − long. node) $+0''{\cdot}39$ cos (mean anom. − long. node)

VI.

Correction of the Coefficient of Parallactic Equation.

The observations with the altazimuth play an important part in the determination of the correction applicable to this coefficient. The author concludes that the value of increase cannot be far from $+2''{\cdot}6$, whence the real value of the coefficient $= 124''{\cdot}7$.

VII.

Correction of the Coefficient of Variation.

The correction derived from the meridional observations $=+0''{\cdot}61$; that from the altazimuth observations $=+0''{\cdot}30$. Adopting $+0''{\cdot}50$, the corrected coefficient will be $+2370''{\cdot}8$.

VIII.

Correction of the Coefficient of Annual Equation.

The corrected value of the coefficient is found to be $670''{\cdot}04$.

IX.

Correction of the Coefficient of Evection.

The corrected value of this coefficient is $=4586''{\cdot}81$.

The author next investigates the corrections applicable to the elements of Ecliptic North Polar Distance.

X.

Correction of the Constant Term of Parallax.

The corrected value of this constant is found to be $57'\ 3''{\cdot}89$.

"The constant thus found," says the author, "is somewhat greater than Plana's, which is $57'\ 3''{\cdot}16$, or Mr. Adams', which is $57'\ 2''{\cdot}3$; and a little greater than that found from the Cambridge Observations (*Mem. Ast. Soc.* vol. xvii. page 51), which is $57'\ 3''{\cdot}46$. It is worthy of remark that in each instance the constant derived from observation is greater than that derived from theory."

By confining his investigation to the observations subsequent to 1811, which are much more certain than those preceding that year, the author finds the corrected value of the constant to be $57'\ 3''{\cdot}55$. This brings the various numbers into better harmony.

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Under this head the author has inserted the following footnote, to which he calls especial attention:—

"I regret to say that in the former *Memoir*, vol. xvii., pages 51 and 52, I have committed a most serious error in my statement of the constant of parallax employed in the former *Reductions*. I have given it as 57′ 3″·16, whereas it is stated explicitly in the *Reductions* (Introduction, pages xxi and xxii) and has been verified by reference to the manuscripts that the constant employed was 57′ 1″·8. I cannot account for this confusion in a research which so much engrossed my attention, and in which I was so much impressed with the difficulties of reconciling results."

The rectification of the error here referred to has enabled the author almost entirely to remove the discordances which presented themselves in the former paper between the definitive value of the constant of parallax which he arrived at by a discussion of the observations down to 1830, and the values of the same constant indicated respectively by observations made at Cambridge and Greenwich subsequently to that date.

XI.

Correction of the Inclination of the Moon's Orbit; Terms of Long Period in the Inclination of the Orbit.

The value of the inclination is found to be

18535″·55

The inequality in inclination is represented by the following terms:—

− 0″·73 × cos long. of node − 1″·82 × sine longitude of node.

XII.

Correction of the Argument of Latitude and of the Motion of the Argument: Terms of Long Period in the Argument.

The secular motion of argument is to be diminished by 68″·6. Damoiseau's epoch is correct for 1781 nearly. The inequalities in argument of latitude are found to be

+ 23″·46 × cosine longitude of node − 5″·09 × sine longitude of node.

XIII.

Small Terms in the Moon's Latitude produced by the Combination of the Small Terms of Long Period, in the Inclination and in the Argument of Latitude.

Omitting two small terms of insensible value, the author obtains for the terms of ecliptic north polar distance, depending upon the argument "longitude from the first point of *Aries*,"

$$+ 1''\cdot 96 \text{ cosine } u - 8''\cdot 59 \sin u,$$

u denoting the moon's true longitude.